

Fiber Optic LAN Components

HFE419x-541

LC Connectorized High Speed VCSEL 2.5 Gbps

FEATURES

- Designed for small form factor transceivers
- Prealigned connector sleeve that is compatible with the LC standard (LC is a trademark of Lucent Technologies)
- Designed for drive currents
- Optimized for low dependence of electrical properties over temperature
- High speed ≥ 1 GHz
- Two different laser/ photodiode polarities
- Attenuating coating
- Packaged with a photodetector



The HFE419x-541 is a high-performance 850 nm VCSEL (Vertical Cavity Surface-Emitting Laser) packaged for high-speed data communications. This product combines all the performance advantages of the VCSEL with a custom designed power monitor diode. The power monitor diode can be used with appropriate feedback control circuitry to set a maximum power level for each VCSEL. In addition, built-in power attenuation reduces the effective slope efficiency. These combined features simplify design for high data rate communication and eye safety.

Packaged in a fiber receptacle sleeve, this high radiance VCSEL is designed to convert electrical current into optical power that can be used in fiber optic communications and other applications. As the current varies above threshold, the light intensity increases proportionally.

The HFE419x-541 is designed to be used with inexpensive silicon or gallium arsenide detectors, but excellent performance can also be achieved with some indium gallium arsenide detectors.

The low drive current requirement makes direct drive from PECL (Positive Emitter Coupled Logic) or EML (Emitter Coupled Logic) gates possible and eases driver design.

The HFE419x-541 is a prealigned and focused fiber optic transmitter designed to interface with 50/125 and 62.5/125 μm multimode fiber.



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ABSOLUTE MAXIMUM RATINGS

Parameter	Rating
Storage Temperature	-40 to +85°C
Operating Temperature	0 to +70°C
Lead Solder Temperature	260°C, 10 sec.
Continuous Optical Output Power (Any Current)	5 mW
Laser Diode Reverse Voltage ($I_R=10\ \mu\text{A}$)	5 V
Laser Continuous Forward Current, Heat-Sinked	12 mA
PIN Photodiode Forward Current	10 mA

NOTICE

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

ELECTRO-OPTICAL CHARACTERISTICS ($T_A=25^\circ\text{C}$ unless otherwise stated)

VCSEL Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Peak Fiber Coupled Optical Power (See threshold current and slope efficiency which control power output)	$I_F=7\ \text{mA av.}$ 50/125 μm fiber NA=0.20	P_{OC}		500		μW	1
Threshold Current		I_{TH}	1	2	3	mA	
Threshold Current Temperature Variation	$T_A = 0^\circ\text{C to } 70^\circ\text{C}$	ΔI_{TH}	-1.5		1.5	mA	2
Slope Efficiency		η	0.04		0.16	mW/mA	3
Slope Efficiency Temperature Variation	$T_A = 0^\circ\text{C to } 70^\circ\text{C}$	$\Delta\eta/\Delta T$		-6000		PPM/ $^\circ\text{C}$	
Peak Wavelength	$I_F=7\ \text{mA}$	λ_p	830	850	860	Nm	
λ_p Temp Coefficient	$I_F=7\ \text{mA}$	$\Delta\lambda_p/\Delta T$		0.06		nm/ $^\circ\text{C}$	
Spectral Bandwidth	$I_F=7\ \text{mA}$, FWHM	$\Delta\lambda$			0.85	nm	
Laser Forward Voltage	$I_F=7\ \text{mA}$	V_F		1.8	2.2	V	
Laser Reverse Voltage	$I_R=10\ \mu\text{A}$	BVR_{LD}		-10		V	
Rise and Fall Time	Bias Above Threshold (20%-80%)	t_r t_f			130 150	ps	4
Relative Intensity Noise	1 GHz BW	RIN		-130	-122	dB/Hz	
Series Resistance	$I_F=7\ \text{mA}$	R_S	22	35	55	Ohms	
Series Resistance Temperature Coefficient	$I_F=7\ \text{mA}$, $0^\circ\text{C to } 70^\circ\text{C}$	dR_S/dT		-3000		PPM/ $^\circ\text{C}$	

Photodiode Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Monitor Current	$P_{OC}=0.5\ \text{mW}$	I_{PD}		0.35		mA	
Monitor Current Temperature Variation	$P_{OC}=0.5\ \text{mW}$	$\Delta I_{PD}/\Delta T$		0.2		%/ $^\circ\text{C}$	
Dark Current	$P_o=0\ \text{mW}$, $V_R=3\ \text{V}$	I_D			20	nA	
PD Reverse Voltage	$P_o=0\ \text{mW}$, $I_R=10\ \mu\text{A}$	BVR_{PD}	30	115		V	5
PD Capacitance	$V_R=0\ \text{V}$, Freq=1 MHz $V_R=3\ \text{V}$, Freq=1 MHz	C		75 40	100 55	pF	

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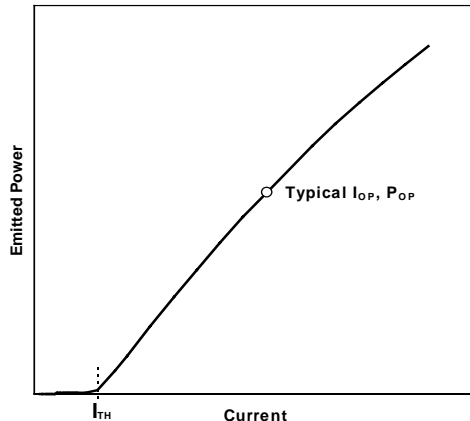
Notes:

1. Operating power is set by the peak operating current

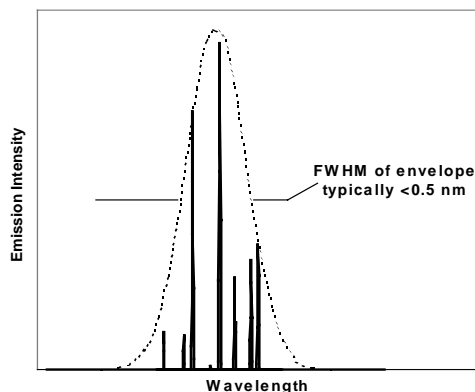
$$I_{PEAK} = I_{BIAS} + I_{MODULATION}$$
2. Operation at temperatures outside the specified range may result in the threshold current exceeding the maximums defined in the electro-optical characteristics table.
3. Slope efficiency is defined as $\Delta P_o / \Delta I_F$ at a total power output of 0.5 mW. Slope efficiency is intentionally lowered to the values shown by optical attenuation.
4. Rise and fall times are sensitive to drive electronics.
5. To safeguard the VCSEL from current spike damage, short the VCSEL anode and cathode to each other during photodiode BVR verification testing.

TYPICAL PERFORMANCE CURVES

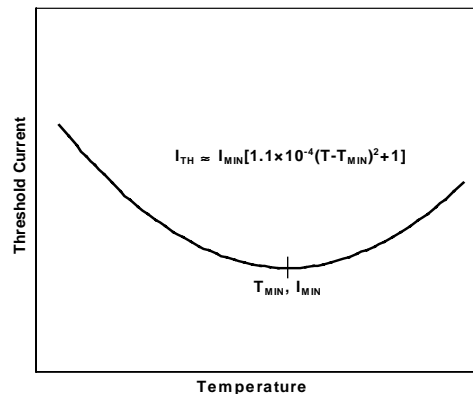
Emitted Power vs. Current: Power varies approximately linearly with current above threshold.



Emission Intensity vs. Wavelength: Typical 10 mA spectrum comprises multiple lines corresponding to multiple transverse modes.



Threshold Current vs. Temperature: Threshold current varies parabolically with temperature; thus it can be nearly constant for a limited temperature range.



NOTICE

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product.



The VCSEL is a class IIIb laser and should be treated as a potential eye hazard. Due to the size of the component, the applicable warning logotype, aperture label, and certification/identification label cannot be placed on the component itself. These labels can be found on the individual envelope in which the VCSEL unit is packaged, or attached to the shipping package.

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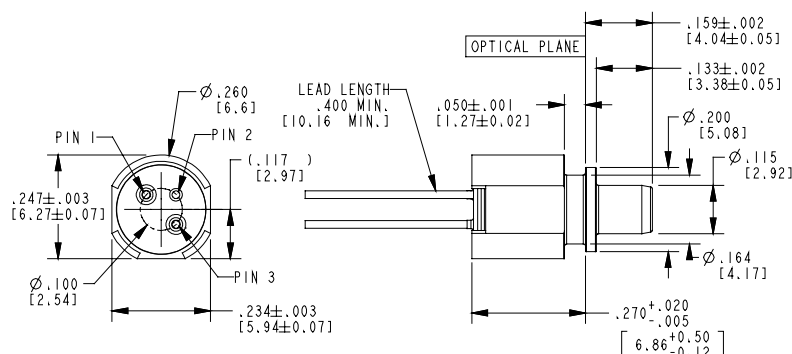
HFE419x-541

ORDER GUIDE

Catalog Listing	Description
HFE4190-541	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Anode Common
HFE4191-541	Attenuated VCSEL with Back Monitor Photodiode - VCSEL Cathode Common

MOUNTING DIMENSIONS (for reference only): in./(mm)

Current Dimension



PINOUT

HFE4190-541		HFE4191-541	
Number	Function	Number	Function
1	K _{LD}	1	A _{LD}
2	K _{PD} , A _{LD}	2	K _{LD} , A _{PD}
3	A _{PD}	3	K _{PD}

PINOUT DEFINITIONS

A _{LD}	VCSEL Anode	A _{PD}	Monitor Photodiode Anode
K _{LD}	VCSEL Cathode	K _{PD}	Monitor Photodiode Cathode

WARRANTY/REMEDY

Honeywell warrants goods of its manufacture as being free of defective materials and faulty workmanship. Commencing with the date of shipment, Honeywell's warranty runs for 18 months. If warranted goods are returned to Honeywell during that period of coverage, Honeywell will repair or replace without charge those items it finds defective. The foregoing is Buyer's sole remedy and is **in lieu of all other warranties, expressed or implied, including those of merchantability and fitness for a particular purpose.**

While we provide application assistance, personally and through our literature, it is up to the customer to determine the suitability of the product in the application.

Specifications may change at any time without notice. The information we supply is believed to be accurate and reliable as of this printing. However, we assume no responsibility for its use.

SALES AND SERVICE

Honeywell Sensing and Control serves its customers through a worldwide network of sales offices and distributors. For application assistance, current specifications, pricing or name of the nearest Authorized Distributor, contact a nearby sales office or call:

TELEPHONE

1-800-367-6786 (USA)
1-800-737-3360 (Canada)
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+65-580-3312 (Singapore)
+44 (0) 118 981 9511 (UK)

FAX

1-972-470-4326 (Customer Response Center)
1-972-470-4549 (Fax on demand)
+49 (0) 89 3599971 (Germany)
+65 445 3033 (Singapore)
+44 (0) 118 981 7513 (UK)

INTERNET

<http://www.honeywell.com/VCSEL>
VCSEL@honeywell.com

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Honeywell

Honeywell Inc.
11 West Spring Street
Freeport, Illinois 61032



Printed with Soy Ink
on 50% Recycled Paper



Honeywell Inc.
Optoelectronics Facility
830 East Arapaho Road
Richardson, Texas 75081

**Honeywell Control
Systems Ltd.**
Zodiac House
Calleva Park
Aldermaston, Berkshire
RG7 8HW England

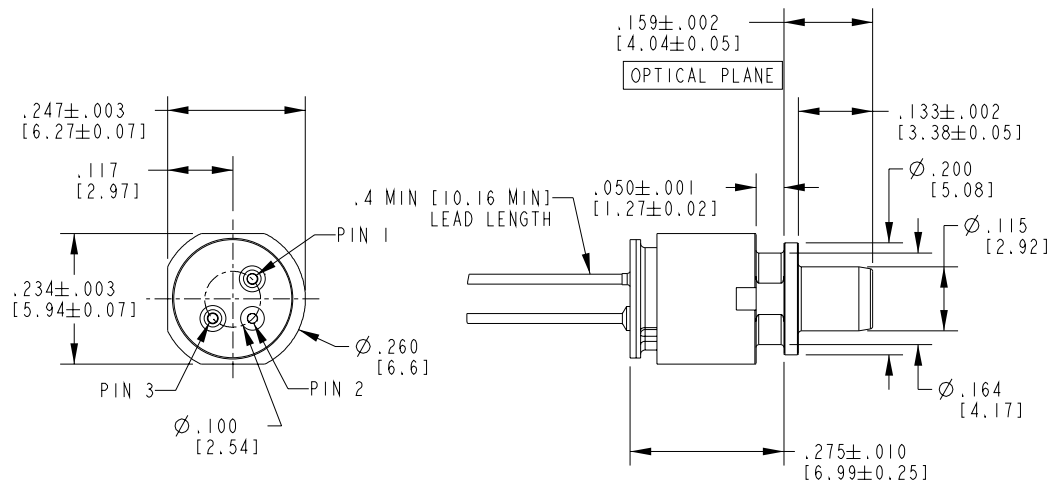
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Future Dimension (available starting April 2002)



PIN 1	PIN 2	PIN 3
VCSEL ANODE	VCSEL CATHODE/PD ANODE	PD CATHODE